Full wwPDB X-ray Structure Validation Report ⓘ

Oct 4, 2023 – 08:54 PM EDT

PDB ID	:	6VI4
Title	:	Nanobody-Enabled Monitoring of Kappa Opioid Receptor States
Authors	:	Che, T.; Roth, B.L.
Deposited on	:	2020-01-11
Resolution	:	3.30 Å(reported)

This is a Full wwPDB X-ray Structure Validation Report for a publicly released PDB entry.

We welcome your comments at *validation@mail.wwpdb.org*
A user guide is available at
https://www.wwpdb.org/validation/2017/XrayValidationReportHelp
with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at
http://www.wwpdb.org/validation/2017/FAQs#types.

The following versions of software and data (see references ⓘ) were used in the production of this report:

MolProbity	:	FAILED
Mogul	:	1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix)	:	1.13
EDS	:	FAILED
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.35.1

1 Overall quality at a glance (i)

The following experimental techniques were used to determine the structure:
X-RAY DIFFRACTION

The reported resolution of this entry is 3.30 Å.

There are no overall percentile quality scores available for this entry.

MolProbity and EDS failed to run properly - the sequence quality summary graphics cannot be shown.

2 Entry composition (i)

There are 4 unique types of molecules in this entry. The entry contains 6047 atoms, of which 0 are hydrogens and 0 are deuteriums.

In the tables below, the ZeroOcc column contains the number of atoms modelled with zero occupancy, the AltConf column contains the number of residues with at least one atom in alternate conformation and the Trace column contains the number of residues modelled with at most 2 atoms.

- Molecule 1 is a protein called Kappa opioid receptor.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	283	Total	C	N	O	S	0	0	0
			2127	1413	339	356	19			
1	B	276	Total	C	N	O	S	0	0	0
			2100	1397	335	349	19			

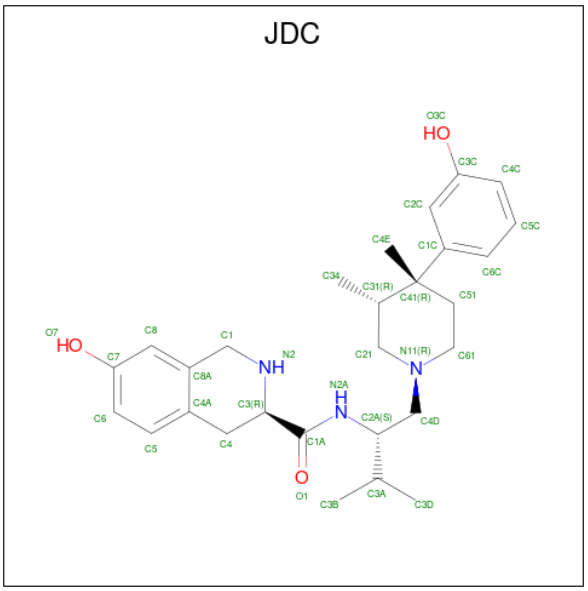
There are 6 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	52	GLY	-	expression tag	UNP P41145
A	53	SER	-	expression tag	UNP P41145
A	135	LEU	ILE	engineered mutation	UNP P41145
B	52	GLY	-	expression tag	UNP P41145
B	53	SER	-	expression tag	UNP P41145
B	135	LEU	ILE	engineered mutation	UNP P41145

- Molecule 2 is a protein called Nanobody 6.

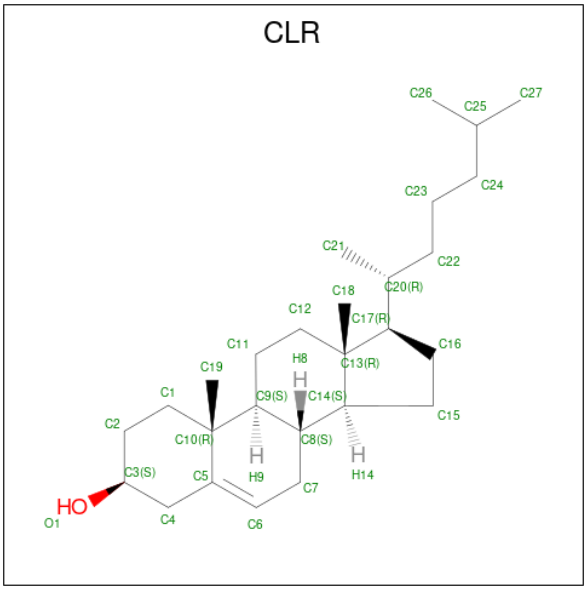
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	C	118	Total	C	N	O	S	0	0	0
			857	532	150	171	4			
2	D	117	Total	C	N	O	S	0	0	0
			867	542	150	171	4			

- Molecule 3 is (3R)-7-hydroxy-N-{(2S)-1-[(3R,4R)-4-(3-hydroxyphenyl)-3,4-dimethylpiperidin-1-yl]-3-methylbutan-2-yl}-1,2,3,4-tetrahydroisoquinoline-3-carboxamide (three-letter code: JDC) (formula: $C_{28}H_{39}N_3O_3$) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	A	1	Total C N O 34 28 3 3	0	0
3	B	1	Total C N O 34 28 3 3	0	0

- Molecule 4 is CHOLESTEROL (three-letter code: CLR) (formula: $C_{27}H_{46}O$).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	B	1	Total C O 28 27 1	0	0

MolProbity and EDS failed to run properly - this section is therefore empty.

3 Data and refinement statistics (i)

EDS failed to run properly - this section is therefore incomplete.

Property	Value	Source
Space group	P 21 2 21	Depositor
Cell constants a, b, c, α, β, γ	102.39Å 108.19Å 155.10Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	30.01 – 3.30	Depositor
% Data completeness (in resolution range)	98.8 (30.01-3.30)	Depositor
R_{merge}	0.18	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	1.57 (at 3.31Å)	Xtriage
Refinement program	PHENIX 1.17.1_3660	Depositor
R, R_{free}	0.242 , 0.271	Depositor
Wilson B-factor (Å^2)	102.4	Xtriage
Anisotropy	0.205	Xtriage
L-test for twinning[2]	$< \|L\| > = 0.47$, $< L^2 > = 0.30$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	6047	wwPDB-VP
Average B, all atoms (Å^2)	87.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 7.69% of the height of the origin peak. No significant pseudotranslation is detected.*

[1] Intensities estimated from amplitudes.

[2] Theoretical values of $< |L| >$, $< L^2 >$ for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

4 Model quality

4.1 Standard geometry

MolProbity failed to run properly - this section is therefore empty.

4.2 Too-close contacts

MolProbity failed to run properly - this section is therefore empty.

4.3 Torsion angles

4.3.1 Protein backbone

MolProbity failed to run properly - this section is therefore empty.

4.3.2 Protein sidechains

MolProbity failed to run properly - this section is therefore empty.

4.3.3 RNA

MolProbity failed to run properly - this section is therefore empty.

4.4 Non-standard residues in protein, DNA, RNA chains

There are no non-standard protein/DNA/RNA residues in this entry.

4.5 Carbohydrates

There are no monosaccharides in this entry.

4.6 Ligand geometry

3 ligands are modelled in this entry.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. The Z score for a bond

length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\#\|Z\| > 2$	Counts	RMSZ	$\#\|Z\| > 2$
4	CLR	B	402	-	31,31,31	0.40	0	48,48,48	1.02	3 (6%)
3	JDC	A	401	-	37,37,37	0.61	0	46,54,54	0.92	3 (6%)
3	JDC	B	401	-	37,37,37	0.47	0	46,54,54	0.97	2 (4%)

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
4	CLR	B	402	-	-	6/10/68/68	0/4/4/4
3	JDC	A	401	-	-	8/22/47/47	1/4/4/4
3	JDC	B	401	-	-	10/22/47/47	0/4/4/4

There are no bond length outliers.

All (8) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
3	B	401	JDC	C4E-C41-C1C	-3.80	101.66	109.38
3	A	401	JDC	C34-C31-C41	-3.29	110.68	113.87
4	B	402	CLR	C10-C9-C8	-2.98	108.26	112.73
3	A	401	JDC	C4-C3-C1A	-2.72	105.56	110.31
4	B	402	CLR	C1-C10-C9	2.64	112.42	108.73
4	B	402	CLR	C14-C8-C9	2.54	112.49	109.09
3	B	401	JDC	C4E-C41-C31	-2.44	108.10	111.00
3	A	401	JDC	C61-C51-C41	-2.03	109.28	111.73

There are no chirality outliers.

All (24) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	A	401	JDC	C2A-C4D-N11-C61
3	B	401	JDC	O1-C1A-C3-N2
3	B	401	JDC	N2A-C1A-C3-N2
3	B	401	JDC	C2A-C4D-N11-C61
3	B	401	JDC	C4D-C2A-C3A-C3D

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Mol	Chain	Res	Type	Atoms
3	B	401	JDC	N2A-C2A-C3A-C3D
3	B	401	JDC	C4D-C2A-C3A-C3B
3	B	401	JDC	N2A-C2A-C3A-C3B
4	B	402	CLR	C17-C20-C22-C23
4	B	402	CLR	C13-C17-C20-C22
4	B	402	CLR	C16-C17-C20-C22
3	A	401	JDC	N2A-C1A-C3-N2
4	B	402	CLR	C13-C17-C20-C21
4	B	402	CLR	C23-C24-C25-C27
3	B	401	JDC	N2A-C2A-C4D-N11
4	B	402	CLR	C16-C17-C20-C21
3	A	401	JDC	O1-C1A-C3-N2
3	A	401	JDC	C4D-C2A-N2A-C1A
3	A	401	JDC	C3A-C2A-N2A-C1A
3	A	401	JDC	O1-C1A-C3-C4
3	A	401	JDC	N2A-C1A-C3-C4
3	B	401	JDC	O1-C1A-C3-C4
3	B	401	JDC	N2A-C1A-C3-C4
3	A	401	JDC	C6C-C1C-C41-C31

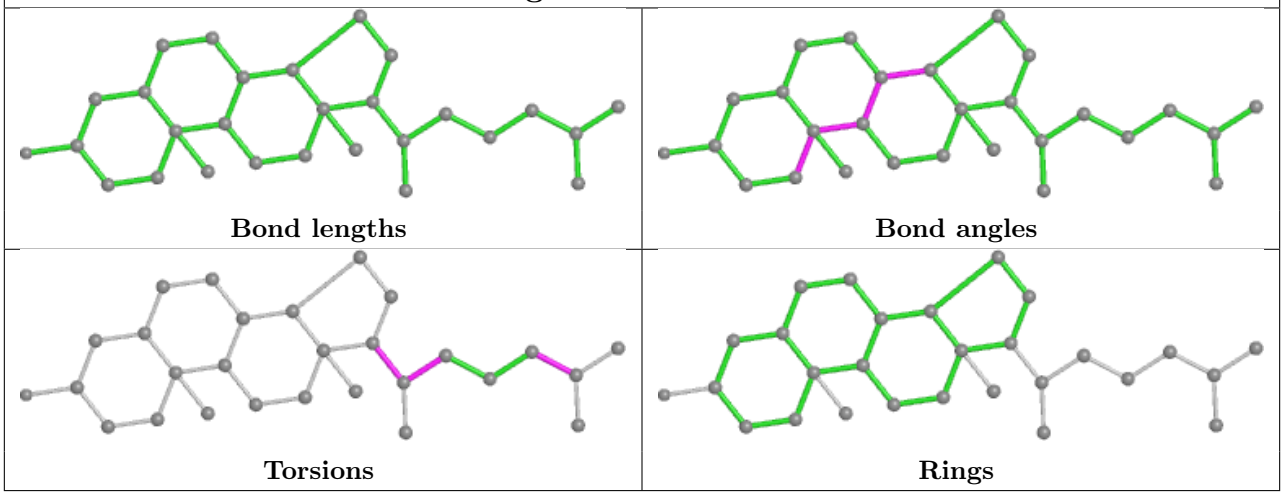
All (1) ring outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	A	401	JDC	C21-C31-C41-C51-C61-N11

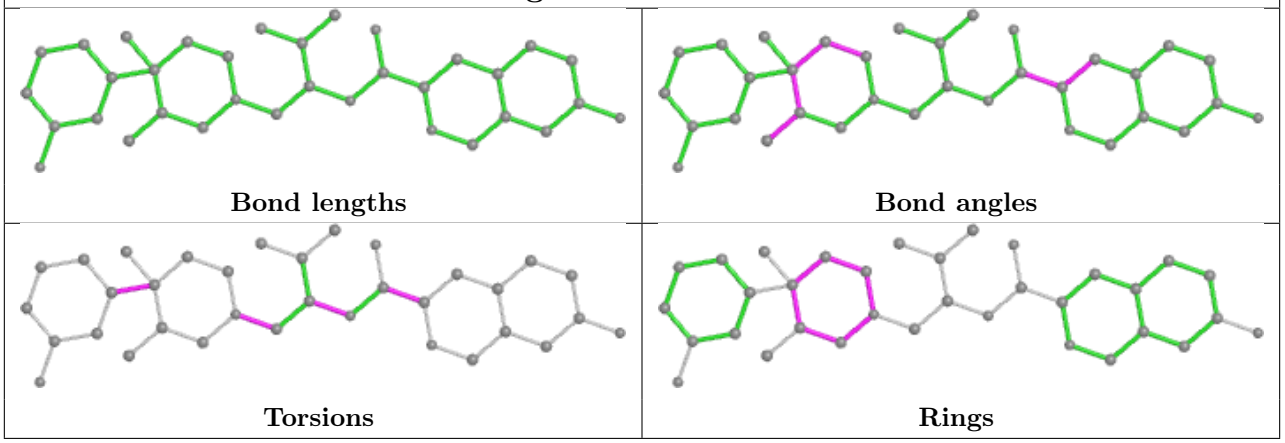
No monomer is involved in short contacts.

The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less then 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.

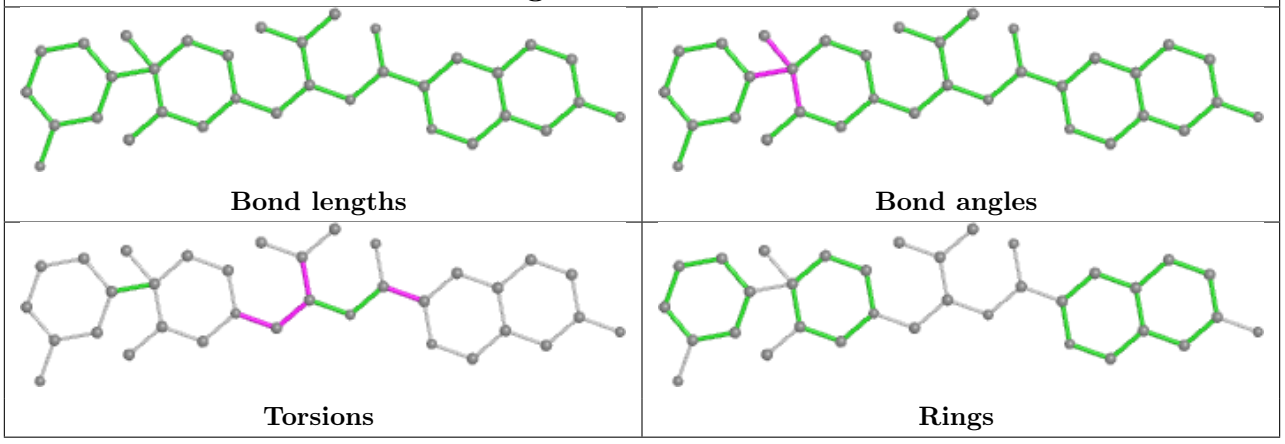
Ligand CLR B 402



Ligand JDC A 401



Ligand JDC B 401



4.7 Other polymers (i)

There are no such residues in this entry.

4.8 Polymer linkage issues (i)

There are no chain breaks in this entry.

5 Fit of model and data

5.1 Protein, DNA and RNA chains

EDS failed to run properly - this section is therefore empty.

5.2 Non-standard residues in protein, DNA, RNA chains

EDS failed to run properly - this section is therefore empty.

5.3 Carbohydrates

EDS failed to run properly - this section is therefore empty.

5.4 Ligands

EDS failed to run properly - this section is therefore empty.

5.5 Other polymers

EDS failed to run properly - this section is therefore empty.